



# ***NOAA Background***

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## **The Gulfstream-IV Jet: NOAA's High-Flying Meteorological Platform**

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NOAA's Gulfstream-IV jet is the agency's newest high-flying, high-tech platform in its hurricane forecasting arsenal. Data collected by the jet—which flies around developing hurricanes to create a detailed picture of the surrounding upper atmosphere—has enabled forecasters to improve hurricane track and landfall predictions by more than 20 percent. This capability directly results in saved lives, protected property, and millions of dollars

saved by more accurately identifying hurricane evacuation areas. The G-IV is a sophisticated twin engine jet whose primary mission is to fly hurricane surveillance missions in support of forecasters at NOAA's National Hurricane Center. With a range of nearly 4,000 nautical miles, the G-IV's cruising altitude of 45,000 feet provides observational coverage at levels critical for defining weather systems in the upper atmosphere.

Since the beginning of the 1997 hurricane season, the G-IV has flown missions around every Atlantic-based hurricane that has posed a potential threat to the United States. The jet's mission covers thousands of square miles surrounding the hurricane, gathering vital data with newly developed GPS (Global Positioning System) dropwindsondes.

The GPS dropwindsonde is a small, lightweight, self-contained and expendable device that measures and transmits vertical profiles of barometric pressure, ambient air temperature, relative humidity, and GPS Doppler shifts, which are used to compute wind speed and direction. Data from the dropwindsondes are transmitted back to the G-IV. Through rigorous quality control measures on board the aircraft, the information is prepared for transmission to the National Hurricane Center in Miami, Fla., and the National Centers for Environmental Prediction in Camp Springs, Md. There the data is available for many numerical forecast models, providing important information about regions—mostly over oceans—in which there are no other sources of weather data.

Computer modeling is the foundation of all NOAA weather and flood forecasts. Weather models solve a

### **A WORD ABOUT NOAA. . .**

The National Oceanic and Atmospheric Administration (NOAA) conducts research and gathers data about the global oceans, atmosphere, space, and sun, and applies this knowledge to science and service that touch the lives of all Americans.

NOAA warns of dangerous weather, charts our seas and skies, guides our use and protection of ocean and coastal resources, and conducts research to improve our understanding and stewardship of the environment which sustains us all.

A Commerce Department agency, NOAA provides these services through five major organizations: the National Weather Service, the National Ocean Service, the National Marine Fisheries Service, the National Environmental Satellite, Data and Information Service, and Office of Oceanic and Atmospheric Research; and numerous special program units. In addition, NOAA research and operational activities are supported by the Nation's seventh uniformed service, the NOAA Corps, a commissioned officer corps of men and women who operate NOAA ships and aircraft, and serve in scientific and administrative posts.

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series of complex equations that simulate the present and future states of the atmosphere. The numerical models that utilize G-IV data fulfill two important purposes: to help forecasters make accurate predictions of how intense a hurricane will be and when and where it will make landfall; and to help hurricane researchers achieve a better understanding of storm processes, thereby improving their forecast models.

### **Hurricane Missions**

The G-IV's first operational hurricane season was 1997, which brought only three major hurricanes. The G-IV flew through Claudette and Erica in the Atlantic basin, and Linda in the eastern Pacific basin. By comparison, the active 1998 season brought six major hurricanes, including the devastating Hurricanes Georges and Mitch, during which the G-IV flew 18 synoptic surveillance missions.

During several of these 1998 missions, the G-IV was joined by NOAA's WP-3 Orion hurricane research aircraft, which fly at much lower altitudes and collect data that complement the G-IV data. Together, these aircraft provided the most comprehensive data coverage ever collected in the environment of hurricanes. The missions not only provided hurricane forecasters with critical data via the numerical model forecasts, but also gave real-time indicators of the overall weather conditions working together that were thought to be influencing the tracks of the hurricanes. These data will also enable researchers to investigate the factors related to hurricane track forecasts and gain further knowledge in this scientific field of study.

### **Winter Storm Missions**

During the winter months, NOAA's interest in severe weather becomes focused on the winter storms affecting the western, central and northeastern United States. These storms are continually being monitored and studied to advance our understanding of them and improve winter storm forecasts.

The G-IV's first operational mission was a research project called the Fronts and Atlantic Storm Tracks

Experiment, or FASTEX, a cooperative program developed by NOAA and the European meteorological community. Both the G-IV and a P-3 participated in this field experiment to collect research data on the severe winter storms that move eastward across the Atlantic Ocean and affect western Europe. Ultimately, the findings should lead to better forecasts for the west coasts of both Europe and North America, as well as a better understanding of how oceanic winter storms affect world climate.

In early 1998 the G-IV participated in a data-collection experiment called the North Pacific Experiment, or NORPEX, designed to help scientists learn more about Pacific-driven storms and improve the forecasts for these events. The weather over the Pacific often has a major and immediate influence on the weather on the U.S. West Coast, and affects weather two to three days later over the eastern United States. Data collected and understanding of storm processes gained during NORPEX proved to be especially valuable with the forecasting of El Niño, which dominated U.S. weather patterns during much of 1998.

### **Aircraft Operations Center**

The G-IV is maintained and operated by NOAA's Aircraft Operations Center located at MacDill Air Force Base in Tampa, Fla. The AOC, part of the Office of NOAA Corps Operations, is charged with the management of NOAA aircraft, personnel, budget, and facilities in support of the assigned fixed-winged and rotor-winged aircraft. Commissioned officers from the NOAA Corps, the nation's smallest uniformed service, manage AOC and fly and navigate NOAA hurricane and research aircraft.

Much of the scientific instrumentation flown aboard NOAA aircraft is designed, built, assembled and calibrated by AOC's Science and Engineering Division. During non-hurricane season months, the G-IV and P-3s are tailored by AOC engineers for use in other severe weather and atmospheric research programs, and flown by NOAA Corps pilots world-wide in a variety of weather conditions. ☺

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